QPA

2017 Workplace and Equal Opportunity Survey of Active Duty Members

Statistical Methodology Report

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2017 WORKPLACE AND EQUAL OPPORTUNITY SURVEY OF ACTIVE DUTY MEMBERS STATISTICAL METHODOLOGY REPORT

Introduction

The Office of People Analytics Center for Health and Resilience (OPA[H&R]) conducts both web-based and paper-and-pen surveys to support the personnel information needs of the Under Secretary of Defense for Personnel and Readiness (USD[P&R]).[1] These surveys assess the attitudes and opinions of the entire Department of Defense (DoD) community on a wide range of personnel issues. Health and Resilience (H&R) Surveys are in-depth studies of topics, which impact the health and well-being of military populations.

This report describes the statistical methodologies for the *2017 Workplace and Equal Opportunity Survey of Active Duty Members* (*2017 WEOA*). The survey fielded from November 20, 2017 to February 09, 2018. The first section describes the sample design and selection of the sample. The second section describes weighting and variance estimation. The final section describes the calculation of contact, cooperation, and response rates for the full sample and population subgroups. Survey estimates for all questions are found in the *2017 Workplace and Equal Opportunity Survey of Active Duty Members: Tabulations of Responses* (OPA, 2018b). Information about administration of the survey and detailed documentation of the survey dataset is found in the *2017 Workplace and Equal Opportunity Survey of Active Duty Members: Administration, datasets, and codebook* (OPA, 2018a).

Sample Design and Selection

Target Population

The *2017 WEOA* was designed to represent individuals meeting the following criteria:

- Active duty members of the Army, Navy, Marine Corps, Air Force, and Coast Guard,

- Paygrades E1–O6,

- On the July 2017 Active Duty Master Edit File (ADMF),

- Valid Personnel status (Not a prisoner, deserter, or unknown)

- National Guard and Reserve members in active duty programs were excluded.

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[1] Prior to 2016, the Health and Resilience (H&R) Research Center resided within the Defense Manpower Data Center (DMDC). In 2016, the Defense Human Resource Activity (DHRA) reorganized and moved H&R under the newly established Office of People Analytics (OPA).

Sampling Frame

The sampling frame consisted of 1,328,754 uniformed service members (1,288,229 DoD and 40,525 Coast Guard) from the July 2017 Active Duty Master Edit File (ADMF). Auxiliary frame data were obtained from the following files:

- July 2017 Active Duty Family Database,

- July 2017 Basic Allowance for Housing (BAH) Population File,

- July 2017 Contingency Tracking System (CTS) File,

- August 2017 Defense Enrollment Eligibility Reporting System (DEERS), and

- July 2017 Reserve Components Common Personnel Data System (RCCPDS) Master File (Dual Spouse Variable)

After selecting the sample, OPA performed additional checks to verify the member was still eligible.

Sample Design

The sample for the *2017 WEOA* survey used a single-stage stratified design. Table 1Table 1 shows the three stratification variables and their associated levels.

Table 1.
Variables for Stratification

Variable Description	Variable Name	Variable Levels
Race/Ethnicity	CRACEETH	1. American Indian/Alaskan Native
		2. Asian
		3. Black
		4. White/Unknown
		5. Hispanic
		6. Native Hawaiian/Pacific Islander
		7. Multi Race
Service	CSERVICE	1. Army
		2. Navy
		3. Marine Corps
		4. Air Force
		5. Coast Guard
Paygrade Grouping	CPAYGRP5	1. E01–E04
		2. E05–E09
		3. W01–W05
		4. O01–O03
		5. O04–O06

OPA partitioned the population frame into 119 strata that were initially determined by the three stratification variables. Levels (specific levels from Table 1 such as "W01–W05") were collapsed when there were less than 200 in the stratum (e.g., collapsing "W01–W05" with "O01–O03" to form a new stratification level "W01–O03"). Race/ethnicity and Service were always preserved.

OPA selected individuals with equal probability and without replacement within each stratum. However, because allocation was not proportional to the size of the strata, selection probabilities varied among strata, and individuals were not selected with equal probability overall. OPA used a nonproportion allocation to achieve adequate sample sizes for all domains (see next section).

Sample Allocation

OPA based the total sample size on precision requirements for 75 estimation domains (Appendix B). Given estimated variable survey costs and anticipated eligibility and response rates, an optimization algorithm determined the minimum-cost allocation that simultaneously satisfied the domain precision requirements. The *2013 WEOA*, *Feb 2016 SOFS-A*, and *Sep 2016 SOFS-A* were used to estimate the eligibility and response rates.

OPA determined the allocation by means of the OPA Sample Planning Tool (SPT), Version 2.1 (Dever & Mason, 2003). This application is based on the method originally developed by J. R. Chromy (1987) and described in Mason, Wheeless, George, Dever, Riemer, and Elig (1995). The SPT defines domain variance equations in terms of unknown stratum

sample sizes and user-specified precision constraints. A cost function is defined in terms of the unknown stratum sample sizes and the per-unit cost of data collection, editing, and processing. The variance equations are solved simultaneously, subject to the constraints imposed, for the sample size that minimizes the cost function. Eligibility rates modify the estimated prevalence rates used in the variance equations, thus affecting the allocation; response rates inflate the allocation, thus affecting the final sample size.

There were 75 domains (e.g., Navy Officers: see Appendix B for complete list) defined for the *2017 WEOA*, and the initial goal was to achieve estimates of percentages with associated precisions of less than 5%. The precision requirement for each domain was based on an estimated prevalence rate of 50% with a 95% confidence interval half-width no greater than ± 5%. Given the maximum contractual sample size of 88,000, OPA\designed a sample expected to achieve an estimated precision of 5% for all but two domains (Coast Guard/Asian and DOD deployed last 12 months). Table 2 provides the sample size by stratification variables.

Table 2.
Sample Size by Stratification Variables

Stratification Variable	Total	Army	Navy	Marine Corps	Air Force	Coast Guard
Sample	88,096	25,474	25,473	17,207	12,147	7,795
Race/Ethnicity						
AIAN	9,683	2,786	4,363	1,355	787	392
Asian	9,451	2,768	2,144	2,787	1,198	554
Black	14,052	4,201	3,129	3,510	1,563	1,649
White/Unknown	22,552	7,869	4,965	3,768	3,480	2,470
Hispanic	13,713	3,779	2,725	3,956	1,503	1,750
NHPI	9,100	4,071	2,073	1,348	1,416	192
Multi Race	9,545	0	6,074	483	2,200	788
Paygrade						
E01–E04	48,359	15,258	12,301	11,590	5,893	3,317
E05–E09	30,527	7,400	11,159	3,987	4,694	3,287
W01–W05	906	437	81	160	0	228
O01–O03	5,663	1,630	1,417	1,038	974	604
O04–O06	2,641	749	515	432	586	359

Weighting

OPA created analytical weights for the *2017 WEOA* to account for unequal probabilities of selection and varying response rates among population subgroups. Sampling weights were computed as the inverse of the selection probabilities and then adjusted for nonresponse (eligibility and completion). The adjusted weights were forced to match population totals and to reduce bias unaccounted for by the previous weighting steps using a technique called raking.

Raking is an iterative process where current weights are forced to known totals for several variables one at a time until the final weights are within a small specified marginal difference for each known total. More details about the weighting process can be found later in this document.

Case Dispositions

As the first step in the weighting process, case dispositions were assigned based on eligibility for the survey and on completion of the questionnaire. Execution of the weighting process and computation of response rates both depended on this classification.

Final case dispositions for weighting were determined using information from personnel records, field operations (as recorded in the Survey Control System [SCS]), and returned questionnaires. No single source of information is entirely complete and correct for determining the case dispositions; inconsistencies among sources were resolved according to the order of precedence shown in Table 3. This order of execution is critical to resolving case dispositions. For example, suppose a sample member refused the survey because it was "too long"; in the absence of any other information, the disposition would be "Active Refusal." However, if a family member of this same individual notified OPA that the sample member had left the military, the disposition of "Ineligible by self- or proxy-report" would override the later disposition, and OPA would code this individual as "ineligible" (SAMP_DC='2' in Table 3). There were 56 (0.06%) sample members who were identified as being ineligible through either the survey instrument (SAMP_DC=3) or other communications about the survey (SAMP_DC=2). In addition to the members that were determined to be ineligible through the survey instrument, OPA excluded members that were no longer on active duty and excluded them from future mailings and notifications. Individuals were excluded if they were no longer on the August 2017 DEERS Medical PITE (there were 1,369 members, see Table 3).

Case disposition counts for the *2017 WEOA* are shown in Table 3. There were 11,935 eligible, complete respondents (SAMP_DC=4). Table 4 presents the number of eligible, complete respondents by the stratifying variables.

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Table 3.
Case Dispositions for Weighting

Case Disposition (SAMP_DC)	Information Source	Conditions	Sample Size
1. Record ineligible	Personnel record	OPA identified members that were no longer on active duty using the August 2017 DEERS Medical PITE.	1,369 (1.6%)
2. Ineligible by self- or proxy-report	Survey Control System (SCS)	The sampled member or a proxy reported to the contractor (DRC) that member was ineligible due to reasons such as "Retired," "Ill," "Incarcerated," "No longer employed by DoD," or "Deceased."	23 (0.03%)
3. Ineligible by survey self-report	Survey eligibility questions	The sampled member was determined to be ineligible based on their response to the first question of the survey questionnaire "Were you on active duty on November 13, 2017?"	33 (0.04%)
4. Eligible, complete response	Item response rate	Item response is at least 50% of base questions and answered at least one of the 12 harassment questions (H1-H12) or one of the 12 discrimination questions (RD1INT-RD12INT)[2].	11,935 (13.6%)
5. Eligible, incomplete response	Item response rate	Survey is not blank but item response is less than 50% of base questions.	1,175 (1.3%)
8. Active refusal	SCS	Refused due to such reasons as "too long," "too intrusive," and "did not want additional communications," etc.	112 (0.1%)
9. Blank return	SCS	Blank questionnaire with no reason given.	105 (0.1%)
10. Postal Non-Deliverable (PND)	SCS	Postal nondeliverable or address not-locatable.	17,051 (19.4%)
11. Nonrespondent	Remainder	Remaining sampled members who did not respond to survey.	56,293 (63.9%)
Total			**88,096 (100%)**

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[2] Base questions are questions asked to all survey members. In addition, H1-H12A refers to the twelve workplace harassment questions (Q29–Q41) and RD1INT–RD12INT refers to the twelve workplace discrimination questions (Q43–Q54).

Table 4.
Complete Eligible Respondents by Stratification Variables

Variables	Total	Army	Navy	Marine Corps	Air Force	Coast Guard
Complete Eligible Respondents	11,935	2,383	2,763	1,868	2,912	2,009
Race/Ethnicity						
AIAN	1,210	241	523	155	180	111
Asian	1,492	351	300	348	361	132
Black	1,733	354	289	374	326	390
White/Unknown	3,195	701	557	414	873	650
Hispanic	1,712	303	306	346	333	424
NHPI	1,172	433	206	162	323	48
Multi Race	1,421	0*	582	69	516	254
Paygrade						
E01–E04	3,625	656	591	671	1,120	587
E05–E09	5,821	1,088	1,636	771	1,309	1,017
W01–W05	269	87	27	57	0	98
O01–O03	1,303	294	329	225	284	171
O04–O06	917	258	180	144	199	136

Note. Army does not have an option for 'multi-race' on their administrative data. Army members can respond to the survey that they are 'multi-race' and their responses will be correctly tabulated in the multi-race reporting category.

Nonresponse Adjustments and Final Weights

After case dispositions were resolved, the sampling weights were adjusted for nonresponse. The sample weights were adjusted for nonresponse in three steps.

- Step 1: Adjust weights for known eligibility

    – Transfer the weight of the 73,561 cases of unknown eligibility (SAMP_DC = 8, 9, 10, or 11) to the 13,166 cases of known eligibility (SAMP_DC = 2, 3, 4, or 5).

- Step 2: Adjust weights for complete respondents

    – Transfer the weight of the 1,175 sample members who returned an incomplete survey (SAMP_DC = 5) to the 11,935 sample members with a complete questionnaire (SAMP_DC = 4).

    – Set the weight to 0 (zero) for all 1,369 record ineligible (SAMP_DC=1).

- Step 3: Rake to known population totals

    – Adjust the weights for the 11,991 cases that are known eligibility (SAMP_DC=2,3, and 4)) to match known population totals

The weighting adjustment factors for eligibility and completion (Steps 1 and 2 above) were computed as the inverse of model-predicted probabilities. An XGBoost[3] (extreme gradient boosting) model for eligibility and completion were fit to predict the probability of eligibility and completion. The reciprocals of the predicted values from these models were used as nonresponse adjustments and applied to the respondents. The XGBoost models were weighted; first by the sampling weight, and second by the eligibility-adjusted weight resulting from multiplying the sampling weight by the eligibility status adjustment. Then, the models were adjusted by multiplying the eligibility status weight by the completion status adjustment. Table 5 provides a list of the independent variables considered for the XGBoost models.

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[3] XGBoost is an R package function and stands for Extreme Gradient Boosting which is a machine learning algorithm used to determine the best model fit.

Table 5.
Variables Used for the Eligibility and Completion Adjustments

Variable	Variable Name	Categories
Military Accession Program Source Code	ACC_SRC_CD	1=Induction
		2=Voluntary enlistment in a Regular Component
		3=Vol enlist - Rsv Comp for Reg DEP - 10 USC 12103/10 USC 513
		4=Voluntary enlistment - Rsv Comp, Sec 511, ref(b). Excl DEP
		5=Voluntary enlistment in a Regular Comp under the National Call to Service
		A=U.S. Military Academy
		B=U.S. Naval Academy
		C=U.S. Air Force Academy
		D=U.S. Coast Guard Academy
		E=U.S. Merchant Marine Academy
		F=Air National Guard Academy of Military Sciences
		G=ROTC/NROTC scholarship program
		H=ROTC/NROTC non-scholarship program
		J=OCS, AOCS, OTS, or PLC
		K=Aviation Cadet program
		L=National Guard state OCS
		M=Direct appointment authority, Commissioned Off, professional
		N=Direct appointment authority, Commissioned Off, all other
		P=Aviation training program other than OCS, AOCS, OTS, or PLC
		R=Direct appointment authority, warrant officer
		S=Direct appointment authority, commissioned warrant officer
		T=Warrant Officer Aviation Training Program
		V=ROTC Scholarship Program 10 USC 2107(a)
		X=Other
		Z=Unknown or Not Applicable
Active Federal Military Service Years Quantity	AFMS_YR_QY_CD	0-48, unknown
AFQT Percentile Score Quantity	AFQT_SCR_QY_CD	0-99, unknown, Officers set to missing
Age	AGE	17-70
Assigned Unit Navy Ashore/Afloat Code	ASSGN_UIC_NV_ASHR_AFLT_CD2	0=Unknown
		1=Shore Duty
		2=Sea Duty CONUS Ships
		3=Overseas Shore Duty
		4=Non-rotated Sea Duty Ships Homeported Overseas
		6=Preferred Overseas Shore Duty

Table 5. (continued)

Variable	Variable Name	Categories
BAH File Match Flag	BAHFLAG	N=No match to the BAH file
		Y=Match to the BAH file
Basic Allowance for Housing Status	BAHREC_CD	.=Missing
		1=Not receiving BAH
		2=Receiving BAH
		0=Unknown
Base Flag	BASEFLG	N=No base name available
		Y=Base name available
Base Name	BASENAME	Full list in Appendix A
Base Size	BASESIZE	1-95042, unknown
Buy Email Flag	BUYEMAIL	0=Do not buy email address
		1=Buy email address
Conus Flag	CCONUS	0=Unknown
		1=Conus (continental United States)
		2=Oconus (outside the continental United States)
Education	CEDUC	1=No college
		2=Some college
		3=4-year degree
		4=Grad/Prof degree
Child Count	CHILDCNT	0–10
Marital Status	CMARITAL	1=Not married
		2=Married
Contact Flag	CONTACT_FLG	0=Incomplete Contact Information
		1=Perfect Contact Information[4]
Race/Ethnicity	CRACEETH	1=American Indiana/Alaskan Native
		2=Asian
		3=Black/African American
		4=White/Unknown
		5=Hispanic
		6=Hawaiian/Pacific Islander
		7=Multi Race
World Regions (4 level)	CREGINS	0=Unknown
		1=US & US territories
		2=Europe
		3=Other
		4=Asia & Pacific Islands

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[4] Add the variables used and criteria

Table 5. (continued)

Variable	Variable Name	Categories
Service	CSERVICE	1=Army
		2=Navy
		3=Marine Corps
		4=Air Force
		5=Coast Guard
Gender	CSEX	1=Male/Unknown
		2=Female
Currently Deployed	CUR_DEPLOY	0=Not currently deployed (including never deployed)
		1=Currently deployed
Deployment Count	DCOUNT	0-27
Deployed in the last 12 months	DEPLOY12	0=Not deployed in the last 12 months
		1=Deployed in the last 12 months or currently deployed
Deployed in the last 24 months	DEPLOY24	0=Not deployed in the last 24 months
		1=Deployed in the last 24 months or currently deployed
Dual Service Spouse flag	DSVC_SP	1=No dual spouse
		2=Dual spouse
Family Status	FAMSTAT	1=Single with child(ren)
		2=Single without child(ren)
		3=Married with child(ren)
		4=Married without child(ren)
Duty UIC address flag	FLG_DU	N=No Duty UIC Address
		Y=Duty UIC Address
Military Longevity Pay Service Years Quantity	MIL_LGV_PAY_CD	0–40, Unknown
Number of Active Duty Members in Member Duty UIC	N_UIC	1–7974
Number of Minorities in Member Duty UIC	N_UICMIN	0–3270
Number of Non-Minorities in Member Duty UIC	N_UICNON	0–4704
Duty occupation grouping[5]	OCCGRP2	1=Poor Responders
		2=Average Responders
		3=Good Responders

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[5] Based on 10 years of survey data, OPA coded occupation codes into three groups consisting of the best, average, and lowest responding occupation groups.

Table 5. (continued)

Variable	Variable Name	Categories
Offbase status	OFFBASE	0=Unknown
		1=On Base
		2=Off Base
Percentage of Minorities in Member Duty UIC	P_UICMIN	0–100
Paygrade	PAYGRADE	E01–E09, W01–W05, O01–O06

Finally, the nonresponse-adjusted weights were modified through a process called raking[6] (Step 3 above). The purpose of raking is to use known information about the survey population to increase the precision of survey estimates. This information consists of totals for different levels of variables (such as demographic characteristics). During the raking process, sampled individuals are first categorized into the cells of a table defined by two or more variables—called raking dimensions. The goal of raking is to adjust the weights so that they add up to the known totals—called control totals—for the different levels within each raking dimension. Processing one dimension at a time, raking computes a proportional adjustment to the weights associated with each level of the raking dimension. After all dimensions are adjusted, the process is repeated until the totals for all levels of the raking dimensions are equal to the corresponding control totals (within a specified tolerance). For example, the level E1–E4 from the variable CPAYGRP5 had a population total of roughly 560,000. Suppose the weighted number of E1–E4 members after the eligibility and completion adjustments was 550,000. OPA computes the raking factor of 1.018 (560,000 / 550,000) and multiplies this factor by the weight for E1–E4 members to ensure the weighted estimates equal the target population. After raking, the sum of the weights for E1–E4 members will equal 560,000.

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[6] Raking, or iterative proportional fitting, is an algorithm for adjusting weights to match control totals.

Table 6.
Variables used for Raking

Variable	Variable Name	Categories
Service	CSERVICE	1. Army
		2. Navy
		3. Marine Corps
		4. Air Force
		5. Coast Guard
Paygrade (5 levels)	CPAYGRP5	1. E01–E04
		2. E05–E09
		3. W01–W05
		4. O01–O03
		5. O04–O06
Paygrade (2 levels)	CPAYGRP6	1. Enlisted
		2. Officers
Deployed in the last 12 months	DEPLOY12	0. Not Deployed in the Last 12 Months
		1. Deployed in the Last 12 Months or Currently Deployed
Gender	CSEX	1. Male/Unknown
		2. Female
Race/Ethnicity	CRACEETH	1. American Indiana/Alaskan Native
		2. Asian
		3. Black/African American
		4. White/Unknown
		5. Hispanic
		6. Hawaiian/Pacific Islander
		7. Multi Race

Table 6. (continued)

Variable	Variable Name	Categories
Service by Race/ethnicity	SERVRACE	1. Army White/Unknown
		2. Army Black
		3. Army Hispanic
		4. Army Asian
		5. Army Other
		6. Navy White/Unknown
		7. Navy Black
		8. Navy Hispanic
		9. Navy Asian
		10. Navy Other
		11. Marine Corps White/Unknown
		12. Marine Corps Black
		13. Marine Corps Hispanic
		14. Marine Corps Asian
		15. Marine Corps Other
		16. Air Force White/Unknown
		17. Air Force Black
		18. Air Force Hispanic
		19. Air Force Asian
		20. Air Force Other
		21. Coast Guard White/Unknown
		22. Coast Guard Black
		23. Coast Guard Hispanic
		24. Coast Guard Asian
		25. Coast Guard Other
Service by Paygrade (2 level)	SERVENL	1. Army Enlisted
		2. Army Officer
		3. Navy Enlisted
		4. Navy Officer
		5. Marine Corps Enlisted
		6. Marine Corps Officer
		7. Air Force Enlisted
		8. Air Force Officer
		9. Coast Guard Enlisted
		10. Coast Guard Officer

Table 7 provides summaries of the distributions of the sampling weights, intermediate weights, final weights, and adjustment factors for eligible respondents. Eligible respondents (SAMP_DC=4) are those individuals who were 1) eligible to participate in the survey, 2) completed 50% of the base survey items, and 3) answered at least one of the 12 harassment questions (Q29–Q40) or one of the 12 discrimination questions (Q43–Q54) asked of them.

The mean sampling weights for the entire sample was 15.1[7] and the mean for the complete eligible respondents was 17.3. The nonresponse adjustment for eligibility status makes the biggest adjustment to the weights (mean is 5.9), in terms of increasing both the mean and the coefficient of variation (CV) of the weights. The two remaining adjustments for nonresponse among the eligible population and the final raking (mean is 1.1 and 1.0 respectively) have a modest effect on increasing the mean weight.

Table 7.
Distribution of Weights and Adjustment Factors for Complete Eligible Respondents

Statistic	Sampling Weight	Eligibility Status Adjusted Weight	Complete Eligible Response Adjusted Weight	Final Weight With Non-response and Raking Adjustment	Eligibility Status Adjustment	Complete Eligible Response Adjustment	Raking Adjustment
N	11,935	11,935	11,935	11,935	11,935	11,935	11,935
MIN	1.0	2.0	2.2	2.1	2.0	1.0	0.4
MAX	77.9	1,149.6	1,389.6	2,370.5	38.3	2.0	2.0
MEAN	17.3	86.1	95.2	110.3	5.9	1.1	1.0
STD	19.5	101.1	113.7	158.2	4.3	0.0	0.3
CV	1.1	1.2	1.2	1.4	0.7	0.0	0.2

Table 8 shows the sum of the weights at different stages of weighting. In column 3, 'Sum of Eligibility Status Adjusted Weights', OPA distributed the sampling weights for non-respondents with unknown eligibility status to cases with known eligibility status (rows 1 and 2) and shows the weights after OPA set the weights of record ineligibles to zero. In column 4, OPA distributed the eligibility-adjusted weights of eligible respondents providing incomplete surveys to complete eligible respondents. Finally, column 5 shows the redistributed weights of cases in rows 1 and 2 to match the true counts from the sampling frame.

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[7] This value is not shown in Table 7Table 7

Table 8.
Sum of Weights by Eligibility Status

Eligibility Status	Sum of Sampling Weights	Sum of Eligibility Status Adjusted Weights	Sum of Complete Eligible Response Adjusted Weights	Sum of Final Weights With Nonresponse and Raking Adjustments
1. Eligible respondent	206,698	1,028,164	1,136,373	1,316,185
2. Ineligible	1,067	9,224	9,224	12,569
3. Non-respondent	1,100,706	107,611	0	0
4. Record ineligible	20,283	0	0	0
Total	**1,328,754**	**1,144,999**	**1,145,597**	**1,328,754**

Variance Estimation

Sampling error is the uncertainty associated with an estimate that is based on data gathered from a sample of the population rather than the full population. Note that sample-based estimates will vary depending on the particular sample selected from the population. Measures of the magnitude of sampling error, such as the variance and the standard error (the square root of the variance), reflect the variation in the estimates over all possible samples that could have been selected from the population using the same sampling methodology. Analysis of the *2017 WEOA* data required a variance estimation procedure that accounted for the weighting procedures. The final step of the weighting process was to define strata for variance estimation by Taylor series linearization. The *2017 WEOA* variance estimation strata corresponded closely to the design strata; however, it was necessary to collapse some sampling strata containing fewer than 30 complete eligible responses with non-zero final weights with similar strata. Ninety-nine variance strata were defined for the *2017 WEOA*.

Contact, Cooperation, and Response Rates

Contact, cooperation, and response rates were calculated in accordance with the recommendations of the American Association for Public Opinion Research (AAPOR, 2016 Standard Definitions), which estimates the proportion of eligible respondents among cases of unknown eligibility (SAMP_DC = 10 and 11).

The *contact rate* uses the concepts of AAPOR standard formula CON2 and is defined as

$$CON2 = \frac{(I+P)+R+O-e(O)}{(I+P)+R+O+NC-e(NC+O)} = \frac{\text{adjusted contacted sample}}{\text{adjusted eligible sample}} = \frac{N_C}{N_E}.$$

The *cooperation rate* uses the concepts of AAPOR standard formula COOP2 and is defined as:

$$COOP2 = \frac{(I+P)}{(I+P)+R+O-e(O)} = \frac{\text{complete eligibles}}{\text{adjusted contacted sample}} = \frac{N_R}{N_C}.$$

The *response rate* uses the concepts of AAPOR standard formula RR4 and is defined as:

$$RR4 = \frac{(I+P)}{(I+P)+R+O+NC-e(NC+O)} = \frac{\text{complete eligibles}}{\text{adjusted eligible sample}} = \frac{N_R}{N_E}.$$

Where:

I = Fully complete responses according to RR4 are greater than 80% complete (SAMP_DC=4).

P = Partially complete responses according to RR4 are between 50–80% complete (SAMP_DC=4).

R = Refusal and break-off according to RR4 are less than 50% complete (SAMP_DC=5, 8, and 9)[8]

NC = Non-contact (SAMP_DC =10)

O = Other (SAMP_DC = 11)[9]

e(O) = Estimated ineligible nonrespondents

e(NC) = Estimated ineligible PND

N_C = Adjusted contacted sample

N_E = Adjusted eligible sample

N_R = Complete eligibles[10]

Table 9 shows the corresponding sample disposition codes associated with the response categories.

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[8] OPA considers these all cases of known eligibility.
[9] These are all nonrespondents which OPA considers cases of unknown eligibility.
[10] Complete eligible is an OPA term that applies to self-administered surveys, which relates to the terms complete and partial interviews used by AAPOR.

Table 9.
Disposition Codes for Response Rates

Response Category	SAMP_DC Values
Eligible Sample	4, 5, 8, 9, 10, 11
Contacted Sample	4, 5, 8, 9, 11
Complete Eligibles	4
Not Returned	11
Eligibility Determined	2, 3, 4, 5, 8, 9
Self-Report Ineligible	2, 3

Ineligibility Rate

The ineligibility rate (IR) is defined as the following and needs to be calculated both weighted and unweighted to be applied to Table 9:

$$IR = \text{Self Report Ineligible/Eligibility Determined.}$$

Estimated Ineligible Postal Non-Deliverable/Not Contacted Rate

The estimated ineligible postal non-deliverable or not contacted (IPNDR) is defined as:

$$IPNDR = (\text{Eligible Sample - Contacted Sample}) * IR.$$

Estimated Ineligible Nonresponse

The estimated ineligible nonresponse (EINR) is defined as:

$$EINR = (\text{Not Returned}) * IR.$$

Adjusted Contact Rate

The adjusted contacted rate (ACR) is defined as:

$$ACR = (\text{Contacted Sample - EINR})/(\text{Eligible Sample - IPNDR - EINR}).$$

Adjusted Cooperation Rate

The adjusted cooperation rate (ACOR) is defined as:

$$ACOR = (\text{Complete Eligible})/(\text{Contacted Sample - EINR}).$$

Adjusted Response Rate

The adjusted response rate (ARR) is defined as:

$$ARR = (\text{Complete Eligible})/(\text{Eligible Sample - IPNDR - EINR}).$$

The final response rate is the product of the contact rate and the cooperation rate. Table 10 shows both weighted and unweighted contact, cooperation, and response rates for the *2017 WEOA*.

Finally, Table 11 shows weighted contact, cooperation, and response rates for the full sample by the stratification variables. The final weighted response rate for the survey was 15.9%.

Table 10.
Contacted, Cooperation, and Response Rates

Type of Rate	Computation	Unweighted (percent)	Weighted (percent)
Contacted	Adjusted contacted sample/Adjusted eligible sample	80.3	83.1
Cooperation	Usable responses/Adjusted contacted sample	17.1	19.1
Response	Usable responses/Adjusted eligible sample	13.8	15.9

Note. Weighted response rates are the official reported rates. Unweighted response rates can be influenced by the sample design.

Table 11.
Rates for Full Sample and Stratification Level

Key Reporting Domains	Contact Rate (percent)	Cooperation Rate (percent)	Weighted Response Rate (percent)
Sample	83	19	16
American Indian/ Alaskan	84	17	14
Asian	84	22	18
Black/ African American	80	17	14
White, Unknown	84	20	17
Hispanic	80	18	14
Hawaiian / Pacific Islander	82	18	15
Multi Race	84	20	16
Army	80	14	11
Navy	80	17	14
Marine Corps	77	15	11
Air Force	91	28	26
Coast Guard	100	28	28
E01–E04, E00	70	11	8
E05–E09	92	21	19
W01–W05, W00	96	25	25
O01–O03, O00	93	25	24
O04–O06	98	37	36

Note. Reported rates are weighted. Unweighted rates can be influenced by the sample design. This table was rounded for clarity.

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Appendix A.
List of Base Names

List of Base Names

Base Name
*1ST MARINE CORPS DISTRICT
*20TH ASG TAEGU KOREA
*23D ASG CAMP HUMPHREYS
*29 PALMS MC AIR/GRD CMBT CTR
ABERDEEN PROVING GROUND
ADELPHI LAB CENTER
AF PLANT 19
ALAMEDA NAS
ALBANY MCLB
ALBROOK AFS
ALCONBURY UK RAF MOLESWORTH
ALTUS AFB
ANDERSON AFB GUAM
ANDREWS AFB
ANKARA AS
ANNAPOLIS NS(INCL USNA)
ANSBACH BARTON BARRACKS
ARMORY OF MOUNTED COMMANDS
ARMY ATTACHE DEPT OF STATE
ARMY COLD REGIONS RSCH LAB
ARNOLD AFB
AVIANO AB
BAMBERG WARNER BARRACKS
BARKSDALE AFB
BARNES MAP AGS
BARSTOW MCLB
BATTLE CREEK FEDERAL CENTER
BAUMHOLDER H.D.SMITH BRCKS
BEALE AFB
BEAUFORT MCAS
BELLINGHAM MAP
BINDLACH
BLOUNT ISLAND
BOBLINGEN PANZER KASERNE
BROOKLYN USARC
BRUNSWICK NAS
BRUSSELS NATO
BUCHEL AB
BUCKLEY AFB
BUPYEONG CAMP MARKET
BURLINGTON IAP-AGS
CAMERON STATION
CAMP BLANDING

Base Name
CAMP CASEY TONGDUCHON
CAMP DARBY LIVORNO
CAMP EDWARDS - NG
CAMP GUERNSEY
CAMP H. M. SMITH
CAMP LEJEUNE MCB
CAMP PENDLETON
CAMP RED CLOUD UIJONBU KORE
CAMP ROBERTS
CAMP SHELBY
CAMP W G WILLIAMS
CAMP ZAMA TOKYO
CANBERRA A.C.T.
CANNON AFB
CARLISLE BARRACKS
CHARLESTON AFB
CHARLESTON NAVSTA
CHERRY POINT MCAS
CHERRY POINT NAVAL AVIATION DE
CHIEVRES AS BELGIUM
CHINA LAKE NAVWEAPCEN
CHINHAE FLEET ACTIVITY
COAST GUARD ACADEMY
COLUMBUS AFB
COLUMBUS DEF DEPOT
COOS HEAD NAVFAC
CORONADO NAV AMPHIB BASE
CORPUS CHRISTI COAST GUARD
CORPUS CHRISTI NAS
CORRY STATION NTTC
CRANE NAVWEAPSUPPCEN
CROUGTON RAF CROUGHTON
CURTIS BAY COAST GUARD
DAM NECK TRNG CTR ATLANTIC
DAVIS-MONTHAN AFB
DEFENSE DIST DEPOT SUSQUEHANNA
DEFENSE SUPPLY CTR PHILA
DETROIT ARSENAL
DFAS COLUMBUS CENTER
DFAS HEADQUARTERS
DOBBINS ARB
DOD CENTER MONTEREY/FORT ORD
DOTHAN AG
DOVER AFB
DUGWAY PROVING GROUND

Base Name
DYESS AFB
EARLE NAVWEAPSTA
EDWARDS AFB
EGLIN AFB
EIELSON AFB
EL CENTRO NAF
EL GORAH EGYPT
ELLSWORTH AFB
ELMENDORF AFB
ENDIST FORT WORTH TX
ENDIST GALVESTON TX
ENDIST NEW YORK NY
ENGLAND AFB
FAIRCHILD AFB
FALLON NAS
FLEET ACTIVITIES SASEBO
FLEET ASW TRNG CTR PACIFIC
FORSYTH MEM HOSP
FORT A.P. HILL
FORT BELVOIR
FORT BENJAMIN HARRISON
FORT BENNING
FORT BLISS
FORT BRAGG
FORT CAMPBELL
FORT CARSON
FORT COLLINS
FORT DES MOINES
FORT DETRICK
FORT DEVENS
FORT DIX
FORT DRUM
FORT EUSTIS
FORT GEORGE G. MEADE
FORT GORDON
FORT HAMILTON
FORT HOOD
FORT HUACHUCA
FORT IRWIN
FORT JACKSON
FORT JONATHAN WAINWRIGHT
FORT KNOX
FORT LEAVENWORTH
FORT LEE
FORT LEONARD WOOD

Base Name
FORT LESLIE J MCNAIR
FORT LEWIS
FORT MACARTHUR
FORT MCCLELLAN
FORT MCCOY
FORT MONMOUTH
FORT MYER
FORT NATHAN HALE
FORT POLK
FORT RICHARDSON
FORT RILEY
FORT RITCHIE
FORT RUCKER
FORT SAM HOUSTON
FORT SHAFTER
FORT SILL
FORT SNELLING
FORT STEWART
FORT STORY
FORT WORTH USARC
FRANCIS E WARREN AFB
FRANKFURT GERMANY
GAETA NAVAL SUPPORT ACTVITY
GALVESTON COAST GUARD
GEILENKIRCHEN
GEN BILLY MITCHELL FIELD/RSV C
GOODFELLOW AFB
GOWEN FIELD
GRAFENWOHR GERMANY
GRAND FORKS AFB
GRIFFISS NOAD ANG
GUANTANAMO BAY NS
GULFPORT NCBC
HALL AGS
HAMILTON FIELD
HANCOCK FIELD AGS
HANSCOM AFB
HEIDELBERG CAMPBELL BARRACKS
HICKAM AFB
HILL AFB
HOHENFELS GERMANY
HOLLOMAN AFB
HOMESTEAD AFB
HOT SPRINGS MEM FLD
HQ STRICOM ORLANDO

Base Name
HQTRS MARCORPS
HURLBURT FIELD
ILLESHEIM GERMANY
INCURLIK AB ADANA TURKEY
INDIAN HEAD NAV ORD STA
IWAKUNI MCAS
IZMIR AS IZMIR TURKEY
JACKSONVILLE ENDIST
JACKSONVILLE NAS
JOINT BASE ANACOSTIA-BOLLING
KAAPAUN AS
KADENA AB
KADENA FLEET ACTIVITY
KAISERSLAUTERN
KATTERBACH KASERNE(ANSBACH)
KEESLER AFB
KEY WEST COAST GUARD
KEY WEST NAS
KINGS BAY NAVSUBBASE
KINGSVILLE NAS
KIRTLAND AFB
KUNSAN AB
LACKLAND AFB
LAKEHURST NAV AIR ENGR CTR
LANDSTUHL MEDICAL CENTER
LANGLEY AFB
LAUGHLIN AFB
LEMOORE NAS
LEWES NAVFAC
LITTLE CREEK NAV AMPHIB BASE
LITTLE ROCK AFB
LONDON ENGLAND
LOS ANGELES AFB
LUKE AFB
LYNDON B. JOHNSON SPACE CTR
MACDILL AFB
MAKIMINATO OKINAWA CP BUTLER
MALMSTROM AFB
MARCH AFB
MARINE BARRACKS WASH D.C.
MAXWELL AFB (INCL. GUNTER)
MAYPORT NAVSTA
MCAS MIRAMAR
MCBH KANEOHE BAY
MCCDC QUANTICO VA

Base Name
MCCHORD AFB
MCCLELLAN AFB
MCCONNELL AFB
MCGUIRE AFB
MERIDIAN NAS
MIAMI COAST GUARD
MIESAU ARMY DEPOT
MINN/ST PAUL IAP ARS
MINOT AFB
MISAWA AB
MOFFETT FIELD NAS/ANG
MOHRINGEN KELLEY BARRACKS
MONTAUK
MOODY AFB
MORON AB
MOUNTAIN HOME AFB
MTA CAMP ROBINSON
MUNICH
NAPLES FMC
NAPLES NAVAL SUPP ACT
NAPLES U.S. NAVCAMSMED
NAS JRB FT WORTH TX
NAS SIGONELLA SICILY
NAV COASTAL SYSTEMS CTR
NAV SHIPS PARTS CTRL CTR ICP
NAVAL AIR FACILITY ATSUGI
NAVAL AIR FACILITY DETROIT
NAVAL BASE KITSAP-BANGOR
NAVAL BASE KITSAP-BREMERTON
NAVAL BASE PEARL HARBOR
NAVAL HOSPITAL BREMERTON
NAVAL HOSPITAL CHARLESTON
NAVAL HOSPITAL GUAM
NAVAL HOSPITAL OKINAWA
NAVAL HOSPITAL PENSACOLA
NAVAL MEDICAL CTR PORTSMOUTH
NAVAL MEDICAL CTR SAN DIEGO
NAVAL POSTGRADUATE SCH
NAVAL STATION ROTA SPAIN
NAVAL STATION EVERETT
NAVAL STATION GREAT LAKES
NAVAL STATION GUAM
NAVAL STATION NEWPORT
NAVAL STATION STATEN ISLAND
NAVAL SUPPORT ACTIVITY MID-SOU

Base Name
NAVAL TRAINING CTR ORLANDO
NAVCAMS E. PACIFIC
NAVMARCORESCEN MOBILE
NAVRESCEN ST LOUIS MO
NAVSURFWEAPCEN DAHLGREN
NAVY FINANCE CENTER
NAVY RECRUITING AREA THREE
NELLIS AFB
NESEC ST. INGOES
NEW LONDON NAVSUBBASE
NEW ORLEANS NAS JRB
NEW ORLEANS NSA
NEW RIVER MCAS
NG/RSV WARWICK
NNMC BETHESDA
NORFOLK ENDIST
NORFOLK NAV SHIPYD
NORFOLK NAVAL BASE
NORFOLK NSC
NORTH ISLAND NAS
NORWALK DEF FUEL SPT PT
NSA BAHRAIN
NSD YOKOSUKA JAPAN
NSF DIEGO GARCIA
NSGA NORTHWEST
NUC PWR TRNG UNIT IDAHO FALLS
NV SUPPLY CORPS SCHOOL
NV WEAPONS STATION CHARLESTON
OCEANA NAS
OFFUTT AFB
OHARE IAP ARS
OKINAWA TORII STATION
OSAN KOREA
OSAN AIR BASE
OTIS AGB
PARRIS ISLAND MCRD
PASCAGOULA NAVSTA
PATRICK AFB
PATUXENT RIVER NAS
PEASE AGB
PENSACOLA NAS
PENTAGON
PETERSON AFB
PHOENIX ARNG
PICATINNY ARSENAL

Base Name
PINE BLUFF ARSENAL
PIRINCLIK AB
PIRMASENS
PITTSBURGH MEPS / ENDIST
PLATTSBURGH AFB
POPE AFB
PORT HUENEME NCBC
PORTSMOUTH NAV SHIPYD
PRESIDIO OF MONTEREY
PROVIDENCE PRT
PT MUGU NAS
RAF MILDENHALL
RAMSTEIN FRG
RANDOLPH AFB
RED RIVER DEPOT
REDSTONE ARSENAL
RICHMOND AFS
RICHMOND DEF DEPOT
RICKENBACKER IAP
RIYADH SAUDI ARABIA
ROBINS AFB
ROCK ISLAND ARSENAL
ROSECRANS MEM ARPT-AGS
ROTA NS
S. PORTLAND AGS
SACRAMENTO ARMY DEPOT
SAN DIEGO MC RECRUIT DEPOT
SAN DIEGO NAVSTA
SAN DIEGO NAVSUBBASE
SAN DIEGO NSC
SAN PEDRO COAST GUARD
SAN SALVADOR AM. EMBASSY
SAND ISLAND COAST GUARD
SAVANNAH AFS
SCHINNEN NETHERLANDS
SCHOFIELD BARRACKS
SCHRIEVER AFB
SCHWEINFURT LEDWARD BARRACKS
SCOTIA NAVAL ADM BALLSTON
SCOTT AFB
SEAL BEACH NAVWEAPSTA
SECTOR SAN JUAN
SELFRIDGE ANG BASE
SEMBACH FRG
SEOUL KOREA

Base Name
SEYMOUR JOHNSON AFB
SHAPE CASTEAU NATO
SHAW AFB
SHEPPARD AFB
SOUDA BAY CRETE
SOUTH WEYMOUTH NAS
SOUTHERN COMMAND
SPANGDAHLEM AB
ST LOUIS COAST GUARD
STANDIFORD FIELD AGS
STATE COLLEGE ANG STA
STATE MIL. RESERVATION
STAVANGER
STEWART NEWBURGH USARC
STUTTGART GERMANY
TAEGU
TAEGU CAMP HENRY 19 SPT CMD
TERCEIRA AZORES
THE CITADEL
THULE AFB
TINKER AFB
TRAVIS AFB
TREASURE ISLAND NAVSTA
TRIPLER ARMY MEDICAL CENTER
TRUAX FIELD ANG STA
TYNDALL AFB
UNK/RESERVE/NO BASE
US ARMY GARRISON - PANAMA
USA NATICK RSCH & DEV CTR
USAF ACADEMY
USCG ALEXANDRIA VA
USCG ANCHORAGE
USCG CAPE CHARLES VA
USCG DAUPHINE ISLAND
USCG ELIZABETH CITY NC
USCG HAMPTON ROADS VA
USCG JUNEAU
USCG KETCHIKAN
USCG KODIAK
USCG NIAGARA NY
USCG SITKA
USCG TRACEN PETALUMA
USCG VALDEZ
USCG YORKTOWN VA
USMC MOUNTAIN WARFARE TRNG CT

Base Name
VAIHINGEN - PATCH BARRACKS
VANCE AFB
VANDENBERG AFB
VICENZA ITALY
VICKSBURG ENDIST
VILSECK
WALLOPS ISLAND
WALTER REED ARMY MED CTR
WASHINGTON NAVDIST HQ
WATERVLIET ARSENAL
WEST POINT MILRES
WESTOVER ARB AFB
WHIDBEY ISLAND NAS
WHITE OAK NSWC DAHLGREN
WHITE SANDS MISSILE RANGE
WHITEMAN AFB
WHITING FIELD NAS
WIESBADEN GERMANY
WONGJU KANGWON-BO CAMP LONG
WRIGHT-PATTERSON AFB
WYOMING VALLEY ANG CTR
YOKOTA AB
YONGSAN KOREA
YORKTOWN NAVWEAPSTA
YUMA MCAS
YUMA PROVING GROUND

Appendix B.
Estimation Domains

Estimation Domains

Domains	Expected Sample Size	Expected Percent Sampled	Population Size
All Domains	88,096	6.63	1,328,754
DoD	80,301	6.23	1,288,229
DoD*Enlisted	72,278	6.82	1,060,030
DoD*E1 – E4	45,033	8.05	559,614
DoD*E5 – E9	27,245	5.44	500,416
DoD*Officers	8,023	3.52	228,199
DoD*O1 – O3	5,043	3.92	128,816
DoD*O4 – O6	2,294	2.83	81,103
DoD*Male	66,012	6.11	1,079,709
DoD*Female	14,289	6.85	208,520
DoD*White	20,082	2.63	763,560
DoD*Total Minority	60,219	11.48	524,669
DoD*Black	12,403	5.85	211,921
DoD*Hispanic	11,963	6.02	198,664
DoD*AIAN	9,291	77.59	11,975
DoD*Asian	8,897	16.04	55,469
DoD*NHPI	8,908	68.72	12,962
DoD*Two or More Races	8,757	26.00	33,678
DoD*Not Deployed Past 12 Months	72,039	6.23	1,155,765
DoD*Deployed Past 12 Months	8,262	6.24	132,464
DoD*Army	25,474	5.47	466,081
DoD*Army*White	7,869	2.95	267,182
DoD*Army*Total Minority	17,605	8.85	198,899
DoD*Army*Black	4,201	4.22	99,559
DoD*Army*Hispanic	3,779	5.52	68,414
DoD*Army*Asian	2,768	12.37	22,384
DoD*Army*Other Race/ Ethnicity	6,857	80.27	8,542
DoD*Army*Enlisted	22,658	6.04	375,075
DoD*Army*E1 – E4	15,258	7.36	207,431
DoD*Army*E5 – E9	7,400	4.41	167,644
DoD*Army*Officers	2,816	3.09	91,006
DoD*Navy	25,473	7.96	319,946
DoD*Navy*White	4,965	2.84	174,727
DoD*Navy*Total Minority	20,508	14.12	145,219
DoD*Navy*Black	3,129	6.24	50,163
DoD*Navy*Hispanic	2,725	5.65	48,230
DoD*Navy*Asian	2,144	12.71	16,867
DoD*Navy*Other Race/ Ethnicity	12,510	41.76	29,959
DoD*Navy*Enlisted	23,460	8.84	265,267

Domains	Expected Sample Size	Expected Percent Sampled	Population Size
DoD*Navy*E1 – E4	12,301	10.14	121,284
DoD*Navy*E5 – E9	11,159	7.75	143,983
DoD*Navy*Officers	2,013	3.68	54,679
DoD*Marine Corps	17,207	9.35	183,969
DoD*MC*White	3,768	3.22	117,135
DoD*MC*Total Minority	13,439	20.11	66,834
DoD*MC*Black	3,510	18.50	18,968
DoD*MC*Hispanic	3,956	10.54	37,547
DoD*MC*Asian	2,787	53.79	5,181
DoD*MC*Other Race/ Ethnicity	3,186	62.01	5,138
DoD*MC*Enlisted	15,573	9.56	162,983
DoD*MC*E1 – E4	11,581	10.69	108,366
DoD*MC*E5 – E9	3,992	7.31	54,617
DoD*MC*Officers	1,634	7.78	20,986
DoD*Air Force	12,147	3.82	318,233
DoD*AF*White	3,480	1.70	204,516
DoD*AF*Total Minority	8,667	7.62	113,717
DoD*AF*Black	1,563	3.62	43,231
DoD*AF*Hispanic	1,503	3.38	44,473
DoD*AF*Asian	1,198	10.85	11,037
DoD*AF*Other Race/Ethnicity	4,403	29.40	14,976
DoD*AF*Enlisted	10,587	4.12	256,705
DoD*AF*E1 – E4	5,893	4.81	122,533
DoD*AF*E5 – E9	4,694	3.50	134,172
DoD*AF*Officers	1,560	2.54	61,528
Non DOD*Coast Guard	7,795	19.24	40,525
Non DOD*CG*White	2,470	8.35	29,565
Non DOD*CG*Total Minority	5,325	48.59	10,960
Non DOD*CG*Black	1,649	80.1	2,059
Non DOD*CG*Hispanic	1,750	31.3	5,589
Non DOD*CG*Asian	554	100.0	554
Non DOD*CG*Other Race/ Ethnicity	1,372	49.7	2,758
Non DOD*CG*Enlisted	6,600	20.5	32,177
Non DOD*CG*E1 – E4	3,312	24.7	13,401
Non DOD*CG*E5 – E9	3,288	17.5	18,776
Non DOD*CG*Officers	1,195	14.3	8,348

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